

## CLAIMS

1. A vibration actuator including a magnetic circuit device with a magnetic gap, a vibrating member, a coil fixed to said vibrating member and disposed in said magnetic gap, a vibration transmitter, and a suspension plate for elastically suspending said magnetic circuit device to said vibration transmitter in a predetermined direction, said vibration actuator further comprising a primary elastic member interposed between said suspension plate and said magnetic circuit device in said predetermined direction.

2. A vibration actuator as claimed in claim 1, wherein said suspension plate has a central portion and a peripheral portion around said central portion, said peripheral portion being connected to said vibration transmitter, said central portion being connected to said magnetic circuit device through said primary elastic member.

3. A vibration actuator as claimed in claim 2, wherein said suspension plate includes a leaf spring portion extending along a spiral curve between said central and said peripheral portions.

4. A vibration actuator as claimed in claim 3, wherein said suspension plate has a plurality of elongated holes which extends substantially parallel to said spiral curve to form said leaf spring portion therebetween.

5. A vibration actuator as claimed in claim 4, wherein each of said elongated holes has end areas and an intermediate area between said end areas, each of said end areas being defined by a circular surface and a spiral surface which is parallel to said spiral curve, said intermediate area being defined by opposite spiral surface which are parallel to said spiral curve.

6. A vibration actuator as claimed in claim 1, wherein said suspension plate is made of at least one spring material selected from SUS304, SUS301, nickel silver, phosphor bronze, and beryllium-copper (Be-Cu) alloy.

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7. A vibration actuator as claimed in claim 1, wherein said magnetic circuit has any one of an internal magnetic type, an external magnetic type, and a radial type.

8. A vibration actuator as claimed in claim 1, further comprising an additional elastic member fixed between said vibrating member and said vibration transmitter in said predetermined direction.

9. A vibration actuator as claimed in claim 1, wherein each of said vibrating member and said vibration transmitter has a shape selected from a circular shape, an elliptic shape, and an elongated circular shape.

10. A vibration actuator as claimed in claim 1, wherein said vibrating member has a shape selected from a flat plate shape, a disc shape, a curved shape, a corrugation, and a combination of said respective shapes.

11. A vibration actuator as claimed in claim 1, further comprising a connecting member connecting one of central and peripheral parts of said magnetic circuit device to a central part of said suspension plate.

12. A vibration actuator as claimed in claim 11, wherein said primary elastic member is fixed between said suspension plate and said connecting member.

13. A vibration actuator as claimed in claim 1, wherein said suspension plate has a central opening, said magnetic circuit device being fitted in said central opening and fixed to said suspension plate.

14. A vibration actuator as claimed in claim 13, wherein said primary elastic member is fixed between said suspension plate and said magnetic circuit device.

15. A vibration actuator as claimed in claim 1, wherein said coil is fixed to a particular position of said vibrating member by an adhesive.

16. A vibration actuator as claimed in claim 1, wherein said vibration transmitter has at least one sound emitting hole.

17. A vibration actuator as claimed in claim 16, wherein said at least one sound emitting hole makes said vibration transmitter serve as Helmholtz resonator.

18. A vibration actuator as claimed in claim 1, wherein said magnetic circuit device includes a yoke having at least one protrusion adjacent to said magnetic gap.

19. A vibration actuator as claimed in claim 1, further comprising a secondary elastic member fixed between said suspension plate and said vibration transmitter in said predetermined direction.

20. A vibration actuator as claimed in claim 1, wherein said suspension plate and said vibration transmitter are integrally formed by means selected from insert molding, bonding, and welding.

21. A vibration actuator as claimed in claim 1, further comprising a stopper disposed inside said vibration transmitter for adjusting a space between said magnetic circuit device and said vibration transmitter.

22. A vibration actuator as claimed in claim 1, wherein said vibrating member has a part fixed to said suspension plate.

23. A vibration actuator as claimed in claim 1, wherein said vibration transmitter vibrates together with said vibrator when said coil is supplied with a current of a high frequency.

24. A vibration actuator as claimed in claim 1, wherein said vibration transmitter forms a fixed part in a low frequency, and forms an elastic material in the high frequency.

25. A vibration actuator as claimed in claim 1, wherein said vibration transmitter has at least one leak hole for decreasing sound pressure.

26. A vibration actuator as claimed in claim 1, wherein said coil is divided into a plurality of pieces.

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27. A vibration actuator as claimed in claim 1, wherein said vibrating member is formed by a film member made of plastic material selected from polyetherimide, polyethylene terephthalate, polycarbonate, polyphenylene-sulfide, polyarylate, polyimide, and poly-p-phenylene terephthalamide (Aramid).

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